Claims

[c1]   What is claimed is:

1.A method for detecting early fires in a predetermined area, the method comprising:

(a) capturing a plurality of images of the predetermined area during an interval for generating a plurality of difference frames;

(b) detecting a number of pixels that have fire characteristics in each difference frame; and

(c) if the result of step (b) indicates that a flame in the predetermined area substantially increases during the interval, outputting an early fire alarm.

[c2]   2.The method of claim 1 wherein step (b) includes: determining if each pixel of each difference frame complies with the following rules:

$R > Rt$;

$R \geq G > B$; and

$S \geq ((255 - R) * St / Rt)$;

wherein R is a value of a red component of the pixel, Rt is a threshold of the red component, G is a value of a green component of the pixel, B is a value of a blue component of the pixel, S is saturation of the pixel, St is

a threshold of saturation; and

if a pixel complies with the above rules, adjusting the number of pixels that have fire characteristics of the difference frame.

[c3]   3.The method of claim 2 wherein when the value of the red component of a pixel is Rt, the saturation of the pixel is St.

[c4]   4.The method of claim 1 wherein in step (c), if the result of step (b) indicates that a ratio of spreading flame in the predetermined area is over a threshold of spreading flame during the interval, then outputting the early fire alarm.

[c5]   5.The method of claim 1 wherein step (a) including:
comparing two images captured for generating a difference of the two images; and
removing noise from the difference for generating a difference frame.

[c6]   6.A method for detecting a number of pixels that have fire characteristics in a difference frame, the method comprising:
determining if each pixel of the difference frame complies with the following rules:
$R > Rt$;

R≥G>B; and

$S \geq ((255-R)*St/Rt)$;

wherein R is a value of a red component of the pixel, Rt is a threshold of the red component, G is a value of a green component of the pixel, B is a value of a blue component of the pixel, S is saturation of the pixel, St is a threshold of saturation; and

if a pixel complies with the above rules, adjusting the number of pixels that have fire characteristics of the difference frame.

[c7]   7.The method of claim 6 wherein when the value of the red component of a pixel is Rt, the saturation of the pixel is St.

[c8]   8.The method of claim 6 wherein a video detecting system captures images in a predetermined area and the difference frame is generated by removing noise of a difference of two images captured by the video detecting system.

[c9]   9.A video detecting system comprising:
an image capturing device for capturing images;
a logic unit for performing the following steps:
(a) controlling the image capturing device to capture a plurality of images of a predetermined area during an interval for generating a plurality of difference frames;

(b) detecting a number of pixels that have fire characteristics in each difference frame; and

(c) if the result of step (b) indicates that a flame in the predetermined area substantially increases during the interval, outputting an early fire alarm.

[c10]   10. The video detecting system of claim 9 wherein step (b) performed by the logic unit includes:

determining if each pixel of the difference frame complies with the following rules:

$R > Rt$;

$R \geq G > B$; and

$S \geq ((255-R)*St/Rt)$;

wherein R is a value of a red component of the pixel, Rt is a threshold of the red component, G is a value of a green component of the pixel, B is a value of a blue component of the pixel, S is saturation of the pixel, St is a threshold of saturation; and

if a pixel complies with the above rules, adjusting the number of pixels that have fire characteristics of the difference frame.

[c11]   11. The video detecting system of claim 10 wherein when the value of the red component of a pixel is Rt, the saturation of the pixel is St.

[c12]   12. The video detecting system of claim 9 wherein if the

result of step (b) indicates that a ratio of spreading flame in the predetermined area is over a threshold of spreading flame during the interval, the logic unit outputs the early fire alarm.

[c13] 13.The video detecting system of claim 9 wherein step (a) performed by the logic unit includes:

comparing two images captured for generating a difference of the two images; and

removing noise from the difference for generating a difference frame.

[c14] 14.The video detecting system of claim 9 wherein the logic unit is a logic circuit.

[c15] 15.The video detecting system of claim 9 wherein the logic unit is a program code.

[c16] 16. A video detecting system comprising:

an image capturing device for capturing images;

a logic unit for performing the following steps:

(a) determining if pixels of difference frames complies with the following rules, the difference frames generated from images captured by the video detecting system:

$R > Rt$;

$R \geq G > B$; and

$S \geq ((255-R)*St/Rt)$;

wherein R is a value of a red component of the pixel, Rt is a threshold of the red component, G is a value of a green component of the pixel, B is a value of a blue component of the pixel, S is saturation of the pixel, St is a threshold of saturation; and

(b) if a pixel complies with the above rules, adjusting a number of pixels that have fire characteristics of the difference frame.

[c17]   17.The video detecting system of claim 16 wherein when the value of the red component of a pixel is Rt, the saturation of the pixel is St.

[c18]   18.The video detecting system of claim 16 wherein step (a) performed by the logic unit includes:
comparing two images captured for generating a difference of the two images; and
removing noise from the difference for generating a difference frame.

[c19]   19.The video detecting system of claim 16 wherein the logic unit is a logic circuit.

[c20]   20.The video detecting system of claim 16 wherein the logic unit is a program code.